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A Note on Elastic Demand

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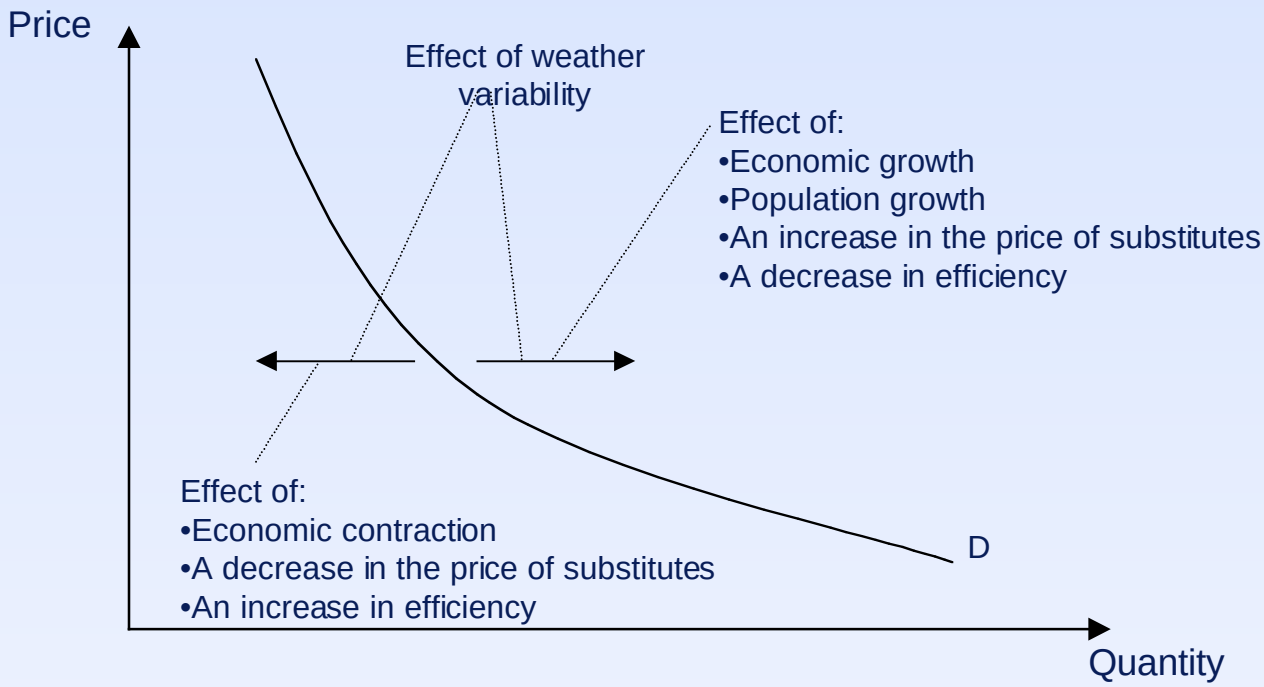
What are we trying to capture?

- The statistics can be daunting, and the extra work is time consuming. So what are the benefits?
- First, we must know what we are trying to capture.



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Why use a model with elastic demand?

- If supply comes at increasing costs, demand that does not respond to price will be overstated.
- Overstatement of demand can lead to:
  - Premature identification of resource depletion
  - Misplaced emphasis on infrastructure constraints
  - Prices that are too high
- Each of these lead to policy responses that are misplaced or premature, and this imposes unnecessary costs
  - Undue emphasis on efficiency improvements in end-use, and inefficient allocation of limited funds to policies that ultimately have little impact.
  - Inappropriate subsidies to develop infrastructures.

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An example...

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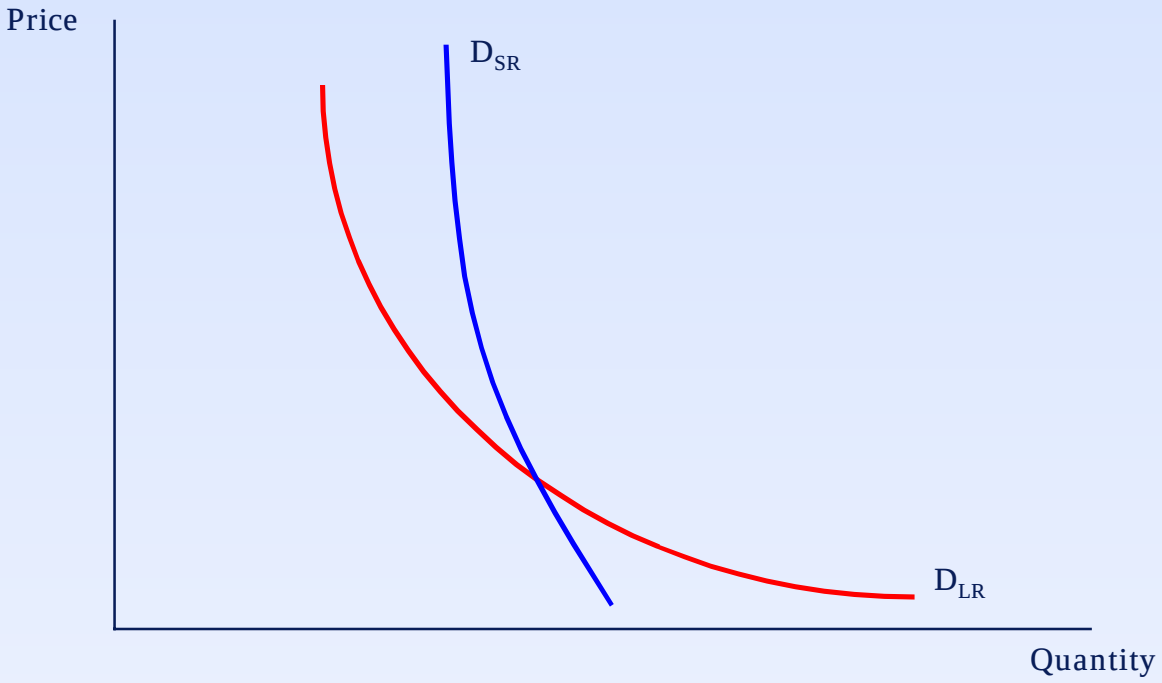
Long run vs. Short Run

- Appropriate model specification allows for the differentiation between the long and short run response of demand to changes in various drivers.
- The effects are different due to things such as: habit persistence by consumers, capital stock turnover, etc.
- With regard to price…



- The long run price elasticity is generally greater than the short run elasticity. Thus, a given change in price will have a greater impact on demand in the long run.
- The CEC is currently implementing elastic demand.

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What is elasticity?

- We must account for the multiple variables that influence demand. To illustrate, recall that price elasticity of natural demand is the percentage change in energy demand given a one percent change in income, *holding all else constant*. If we take natural gas demand to be a function of income (y), price (p), and possibly some other set of variables, then, in general, the total derivative of our natural gas (q) demand function is

$$dq = \frac{\partial q}{\partial y} dy + \frac{\partial q}{\partial p} dp + \ldots$$

- Holding all factors but income constant, with a little algebra we have:

$$\frac{dq}{dp} \cdot \frac{p}{q} = \frac{\partial q}{\partial p} \cdot \frac{p}{q}$$

...which, by definition, is the price elasticity of natural gas demand.

- Note that if we do not properly account for all of the variable influences in a regression setting, we are in effect imposing that there influence is zero. As such, we will carry a term such as the one in brackets below

$$\frac{dq}{dp} \cdot \frac{p}{q} = \frac{\partial q}{\partial p} \cdot \frac{p}{q} + \left\{ \frac{\partial q}{\partial y} \cdot dy \cdot \frac{1}{dp} \frac{p}{q} + \ldots \right\}$$

...which is biased in the direction of the influence of the omitted variables.

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What is elasticity (cont.)?

- Consider the following example. If natural gas consumption has been increasing at 2% per year for 10 years, and income has been increasing at 3% per year for the same time period, a naïve approximation of income elasticity of energy demand would be 0.67. However, if we consider that price may have been changing during the last 10 years, then our naïve estimate is incorrect. Specifically, if price had been falling, then, given a downward sloping demand curve, an income elasticity of 0.67 is an overestimate, and can lead to serious problems when forecasting future demand. Therefore, when modeling natural gas demand, it is important to recognize and account for the many variables (not just income and price) that influence consumption.
- **These issues are important because while inelastic demand will lead to its own problems, misidentification of demand will lead to erroneous elasticity estimates, and this can be equally problematic.**